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ABSTRACT

To assess the effects of age differences, type of task, intelligence (IQ), and reading achievement on referential communication performance, third and fifth grade children were asked to communicate messages for three types of tasks: word pairs, picture descriptions, and school-locations directions. The latter was specifically designed to assess how children perform on a more ecologically valid task than is typically used in referential communication studies. Results indicated that age differences in communication accuracy were greatest on the more ecologically valid task, that performance on the three communication tasks was more highly correlated in fifth than in third grade (although the relationships were not exceptionally strong at either grade level), and that reading achievement was found to correlate significantly with communication accuracy scores, despite the fact that IQ and communication accuracy were not significantly related. (Tables and figures are appended.) (Author/MAI)

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Technical Report No. 55

AGE DIFFERENCES IN CHILDREN'S REFERENTIAL COMMUNICATION PERFORMANCE: AN INVESTIGATION OF TASK EFFECTS

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Age Differences in Children's Referential Communication Performance: An Investigation of Task Effects

Children's referential communication performance has been assessed using a variety of tasks. For example, on Rosenberg and Cohen's (1966) word pair task the speaker and listener are each shown a pair of words (e.g., ocean-river). The speaker knows which word has the line under it and the listener doesn't. The speaker's task is to provide a clue word (e.g., "waves") that would help the listener identify which word is the referent. On this and other tasks it is clear that referential communication performance improves considerably with age (Glucksberg, Krauss, & Higgins, 1975). However, the developmental changes that underlie this improvement are just beginning to be understood.

One plausible explanation for performance differences over age is implied by Rosenberg and Cohen's (1966) model of the communication process. Rosenberg and Cohen contend that given the task of communicating about a referent, the speaker first samples a response from a hierarchy of word associations to the referent. The probability of sampling a response is said to be proportional to its occurrence as a word associate. Next, the speaker is said to compare the sampled response to both the referent and the nonreferent. If the association value to the referent is greater, the message is likely to be emitted; if the value is smaller, the message probably will be rejected and another cycle of sampling-comparison begun. Several recent studies (e.g., Asher, 1976; Asher & Oden, 1976; Whitehurst & Merkur, 1977) have demonstrated that young children do not engage in comparison activity when communicating to a listener.

As a result, they emit messages which do not differentiate the referent from the nonreferent.

It could be suggested that the rather artificial laboratory tasks employed in most referential studies underestimate young children's communication ability, in general, and comparison ability, in particular. Studies have indicated that the topic of discussion greatly affects how well children communicate (e.g., Berlyne & Frommer, 1966; Williams & Naremore, 1969). In discussing these and other studies Cazden (1970) stated that situational variables have often been neglected in studies of children's communication ability. That is, Cazden argued that the choice of a particular topic of discussion or type of task can greatly influence the results obtained. With respect to referential communication, it is quite possible that the unfamiliarity or artificiality of the typical referential task leads children to ignore what they do appreciate in everyday life--that messages, to be effective, must help a listener select among similar alternatives.

The present study investigated the contribution of task factors by assessing children's performance on a task with considerably more ecological validity than the typical laboratory referential communication task. Children were asked to give directions to a "new child" in their school. Five locations in the school, familiar to all children, were selected. The child was asked to give the newcomer directions to each of the five locations, one location at a time. This task was thought to assess referential communication skills in a situation like one children might encounter in everyday life. The task was inspired by one used by Flavell, Botkin, Fry, Wright, and Jarvis (1968)

in which children critiqued map directions. In that study no speaker performance was assessed.

Third and fifth grade children participated in the present study. In addition to being given the school-locations task, children were given two, more traditional laboratory-type tasks: the word pair task and a picture description task developed by Baldwin, McFarlane, and Garvey (1971). The major question of interest was the magnitude of the age differences on each of the three tasks. If laboratory tasks are underestimating young children's skill, then age differences should be smallest on the directions task. If, however, younger children's failure to engage in comparison activity extends beyond laboratory tasks, age differences should be at least as great on the school-locations task as on the other tasks.

A second purpose of the present study was to examine the relationship of performance across tasks within each age group. Insofar as all three tasks in the present study require the speaker to engage in comparison activity, significant correlations would be expected. Yet each task has unique features which may demand specific skills. The word pair task requires that the speaker produce a succinct (i.e., one word) message that discriminates the referent from the nonreferent. The picture task requires that the speaker attend to subtle perceptual differences between the referent and the highly similar nonreferents. The school-locations task likely requires spatial representation abilities. Thus, it is possible that the correlation between tasks will be modest despite the comparison activity requirement that the three tasks share. Two studies have explored the relationship between performance on different referential tasks and have found

modest correlations ranging from .1 to .5 (Baldwin & Garvey, 1973; Piché, Michlin, Rubin, & Johnson, 1975). However, each study used only one age group and confounded listener with speaker error (Krauss & Glucksberg, 1969) by using listeners who were at the same grade level as the speakers. In the present study, the correlations were examined separately at each age level in order to determine if the pattern of relationships changes across age. Also, speaker's messages were scored by adult judges in order to avoid confounding speaker and listener error.

A third purpose of the present study was to assess the relationship between children's referential communication accuracy and their reading achievement and IQ test scores. Most previous studies have found no relationship between IQ scores and communication accuracy (Glucksberg et al., 1975), but research to date has not examined the relationship between communication accuracy and reading achievement. In the present study correlation coefficients were computed between each of the three tasks and both IQ and reading achievement test performance.

Method

Subjects

The children attended a predominately middle class school in Champaign, Illinois. Of 23 third and 24 fifth grade children, 20 third and 16 fifth grade children received parental permission to participate. There were 13 girls and 7 boys in third grade and 7 girls and 9 boys in fifth grade. The mean age of third grade children was 8.75 years, and the mean age of the fifth grade children was 11 years.

Procedure

The three tasks were administered individually to each child in one testing session. The order of task presentation was counterbalanced. Within each grade, children were randomly assigned to the six orders of presentation. The experimenter (the first author) wrote down the word pair clues and tape recorded the picture description messages and the school-locations messages on a portable tape recorder. The experimenter later transcribed the tapes. After the tapes had been transcribed, the transcriptions were checked against the tape by the experimenter and one independent rater.

Communication Tasks

School-locations directions task. Five locations in and around the school were selected as referents. The five locations were the office, the child's classroom, the basketball hoops in the playground, the school's exterior "portable white building" (so named by the children) and the gymnasium. All but two children knew the location of these places. These two children did not know the location of the portable white building, and for them the school library was substituted. Figure 1 depicts the map of the school with each referent location designated. All children were tested in the hallway

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Insert Figure 1 about here

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just outside their classroom. Each child was first told that he or she would be playing a directions game. The child was oriented to the game by walking him or her down the corridor to the front door. The child was

told, "Now we are going to tell some directions. I bet you know how to get around your school. Do you know where the office is?" The child had to respond by pointing or verbally indicating the direction. The experimenter checked for knowledge of the other four locations and then continued: "Let's pretend that there is a new person in your class. She (for girls) doesn't know how to find the places we just talked about. I'd like you to pretend you're helping her find the places. We will be always starting from the center hall by the front door of the school. Can you tell me the idea?"

To demonstrate understanding the child had to include the following elements: (a) the new person in class doesn't know where any of the places are, (b) the starting point for each direction is the front door of the school, and (c) the child wants to help the new person find the different locations. For children who were confused, the instructions were repeated until the child understood. This procedure of having an imaginary listener has been used extensively (e.g., Asher & Parke, 1975; Shantz & Wilson, 1972) and posed no conceptual difficulty for the children.

Word pair task. Each child was presented with ten word pairs from Cohen and Klein's (1968) 30-word pair set (e.g., ship-boat, dish-plate, mitten-glove). Two criteria were used to select the word pairs. First, the items had to be sufficiently difficult. Second, the items had to be sensitive to age effects. Cohen and Klein's (1968) raw data were examined to select items that met these two criteria. Word pairs selected were those that: (a) of 40 children at each grade level in Cohen and Klein's third and fifth grade sample at least nine children made an error, and (b) at least two fewer children in fifth than in third grade made an error.

Each word pair was on a card with the referent underlined. Each pair was read to the child and the child was asked to give a one-word message for each pair. A check for the child's understanding was included in the instructions. (See Asher & Parke, 1975, Experiment 2, for the exact instructions.)

Picture description task. Each child was shown the ten picture sets devised by Baldwin et al. (1971). Each set contains seven highly similar pictures, one of which is designated as the referent. The pictures within each set differ on the basis of four attributes that are independently varied. Along with these sets, the child was shown a single picture of the referent for each set. The child received instructions that closely paralleled the word pair instructions, including a check for the child's understanding. Before giving each message, the child was asked to point to the picture in each set that matched the single referent picture. While communicating, the child looked at both the single referent picture and the set of seven similar pictures.

Scoring and Measures

Two methods have been used in previous research to assess the quality of children's messages. The first is to give the child's messages to naive listeners who are asked to identify the referent in each item from each message. Often adult listeners are used rather than peer listeners to avoid confounding speaker and listener error (Asher & Parke, 1975; Krauss & Glucksberg, 1969). In this approach the speaker receives a score based on the number of correct identifications made by the listener from the speaker's clues.

The other method is to have adults judge the quality of the child's messages (Asher, 1976; Flavell et al., 1968). In this case, judges know what the speaker is trying to communicate and rate whether each clue would be effective. Judges' rating of word pair messages have been found to correlate highly with the performance of naive listeners (Asher, 1976). The judge method has a particular advantage over the listener method for the purpose of classifying children as good or poor communicators. In the listener method a listener could identify many of the referents by chance alone. In the word pair task this chance score could be as high as 50%. This results in an overestimation of the number of good messages children have communicated. In contrast, having judges decide whether each clue is good results in a more accurate representation of the speaker's effectiveness. For this reason judge-based scores were used in the present research.

Three college students were asked to judge whether each message for each of the three tasks was effective or not. The judges were unaware of the age or sex of each communicator and were naive with respect to the purposes of the experiment. The average percent agreement between judges for the three tasks was .85 for the word pair task, .87 for the picture task and .76 for the locations task. This level of agreement compares favorably with previous research (Asher, 1976; Asher & Oden, 1976).

Each child received a communication accuracy score for each task. The score was the average number of messages judged to be effective by the three judges. For the word pair and picture description tasks the communication accuracy score could range from zero to ten. For the school-locations

directions task the score could range from zero to five. Accordingly, for purposes of analysis each child's score on the school locations task was doubled.[1]

Children's school-administered IQ and reading achievement test scores were obtained. The IQ test was the Otis-Lennon Mental Ability Test Form J, and it had been administered to all the children when they were in the third grade. Reading achievement scores for the third grade children were from the Metropolitan Achievement Test, Elementary Battery, Form F. The fifth grade children's scores were from the STS Educational Development Series Test, Form A. These test scores were from the children's current school year at the time of the study.

Results

A preliminary analysis showed that task order had no significant effects on any of the three communication scores, and thus task order was dropped from further consideration. Inspection of the reading achievement scores indicated that the third-grade girls had unusually high scores (averaging a year above grade level) relative to the other groups. Since reading achievement scores for the entire sample were significantly correlated with the word pair accuracy scores, $r(33) = .42$, $p < .05$, and with the school-locations directions accuracy scores, $r(33) = .48$, $p < .01$, children's reading achievement scores were used as a covariate in a 2 x 2 (Grade x Sex) multivariate analysis of covariance of the three communication dependent measures. The covariate used in the analysis was the grade-equivalent score for each of the children. It was necessary to make the grade-equivalent scores comparable

for both groups, and so a value of two was subtracted from each of the fifth grader's scores. One fifth grade girl did not have a reading achievement score, and her data were dropped from this analysis.

Table 1 presents the adjusted means for each of the three accuracy measures. As can be seen, improvement over age occurred on all measures, with the largest effect appearing on the directions task. The main effect for grade level was significant, multivariate $F(3,28) = 8.368$, $p < .01$. The main effect for sex, $F(3,28) = < 1$, and the Grade x Sex interaction effect $F(3,28) = 1.512$, were not significant.

Insert Table 1 about here

A significant analysis was also performed to further investigate the pattern of age differences on the three measures. Inspection of the standardized weights of the discriminant function indicated that the largest weight, .893, was associated with the school locations measure. The standardized weights associated with the other variables were smaller; .317 for the picture description measure, and .118 for the word pair measure. This analysis indicated that the school locations score contributes the most to the differentiation between grade levels, followed by the picture description measure and then the word pair measure. Thus, this analysis disconfirms the hypothesis that age differences in communication accuracy would be minimized on the locations task.

Next, correlational analyses were performed to examine the relationship between performance on different communication tasks and to examine the

relationship between IQ and communication accuracy, and reading achievement and communication accuracy. Table 2 presents the correlation matrix. Looking first at the relationship between communication tasks, it can be seen that third grade children's communication accuracy scores were essentially uncorrelated, except for a moderate correlation between the word pair and location directions scores, $r(18) = .34$, ns. Fifth grade children's word pair and picture description accuracy scores were significantly related, $r(14) = .54$, $p < .05$, and the word pair and location directions scores were moderately related, $r(14) = .35$, ns. Thus, the fifth grade children's communication performance is somewhat more consistent than the third grade children's performance, especially between the word pair and other tasks.

Insert Table 2 about here

Relationships between IQ and communication accuracy, and reading achievement and communication accuracy, are somewhat surprising. As in previous research, IQ was not significantly related to communication performance. However, reading achievement was significantly related on three of six correlations, with a consistently positive relationship at both grade levels between reading achievement and word pair accuracy.

Discussion

A major focus of interest in the present study was the magnitude of age differences in performance on different types of tasks. Fifth grade children communicated more accurately than the third grade children on all three tasks,

with the greatest age differences occurring on the school-locations directions task. This larger difference was a result of fifth grade children performing better on this task than they did on the other two tasks, whereas the average performance for the third grade children was about the same on all three tasks. Thus, even though the third and fifth grade children could find all the locations and visited them each day, the fifth grade children were much more successful in communicating directions. These results suggest that the type of task employed is an important variable in the study of children's referential communication skills. It is especially interesting that the locations task was most sensitive to performance differences in children. Development of such ecologically valid tasks should be a priority for future research, since the results obtained seem more likely to generalize to other "real world" situations than do results from laboratory-type tasks.

The results provide some evidence that fifth grade children's communication skills are more consistent across tasks than third grade children's skills. Support for this claim comes from an examination of the two previous studies that assessed the relationship between performance on different tasks. The correlations between tasks in Baldwin and Garvey's (1973) study, conducted with fifth grade children, are higher than those in the Piché et al. (1975) study, conducted with fourth grade children. These results, along with those of the present study, suggest that communication performance becomes more consistent as children get older. Future research should assess this possibility by assessing older as well as younger children's performance on various tasks.

Still, the relationships between tasks even for fifth grade children in the present study are not exceptionally strong. One implication of this finding, and the findings of the other investigators, is that performance on these different tasks requires different skills in addition to comparison activity. Vocabulary skill, perceptual skill, and spatial representation ability are potentially relevant to performance on these tasks. Thus, grouping tasks that all require comparison activity does not mean that performance on those tasks will be highly related.

A final purpose of the present study was to assess the relationship of IQ and reading achievement to communication accuracy. As in most previous research there was little relationship between IQ and communication accuracy. Reading achievement, however, was more consistently related to performance on the communication tasks, with the relationship strongest for the word pair task. This finding is puzzling; why, when IQ and reading achievement are correlated with one another (see Table 2), does reading achievement correlate more highly than IQ with communication performance? One possibility is that the demand to engage in comparison activity is greater on reading achievement tests. However, an inspection of the IQ and achievement tests indicated that both seem to require the child to engage in comparison activity. That is, the tests are constructed in a multiple-choice-type format in which the child must choose the correct answer from similar answers. About 40% of the items on the Otis-Lennon IQ test are primarily perceptual in nature (e.g., selecting the one geometric shape that is different from three others), whereas the reading tests ask multiple-choice questions about different paragraphs that the child reads. Perhaps the reading achievement test requires the same

kinds of vocabulary skills relevant to performance on the word pair task, thus accounting for the relationship between the two measures. The IQ test, like the picture description task, assesses perceptual skills but does not require that children encode verbally their perceptual discriminations. Further research is needed to illuminate the relationship between IQ, reading achievement, and communication accuracy.

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Footnotes

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[1]To equalize items across tasks it would have been desirable to use ten items on the school-locations task. Pilot testing indicated, however, that additional locations would have been unknown to some children.

Table 1

Third and Fifth Grade Children's Average

Communication Accuracy on Each Task

Grade	Task		
	Word Pair	Picture description	School locations[a]
Third[b]	3.26	2.65	3.22
Fifth[c]	4.10	4.04	6.41

[a]Locations means are doubled.

[b]$\underline{n}$ = 20.

[c]$\underline{n}$ = 15.

Table 2

Correlations for Third and Fifth Grade Children

Correlation	Third (n = 20)	Fifth (n = 16)[a]
Word pairs and pictures	.09	.54**
Word pairs and school locations	.34	.35
Pictures and school locations	.15	-.05
IQ and word pairs	.07	.20
IQ and pictures	.07	.36
IQ and school locations	.59***	.06
Reading achievement and word pairs	.43*	.57**
Reading achievement and pictures	-.13	.04
Reading achievement and school locations	.35	.58**
IQ and reading achievement	.65***	.40

[a] n = 15 for reading achievement.

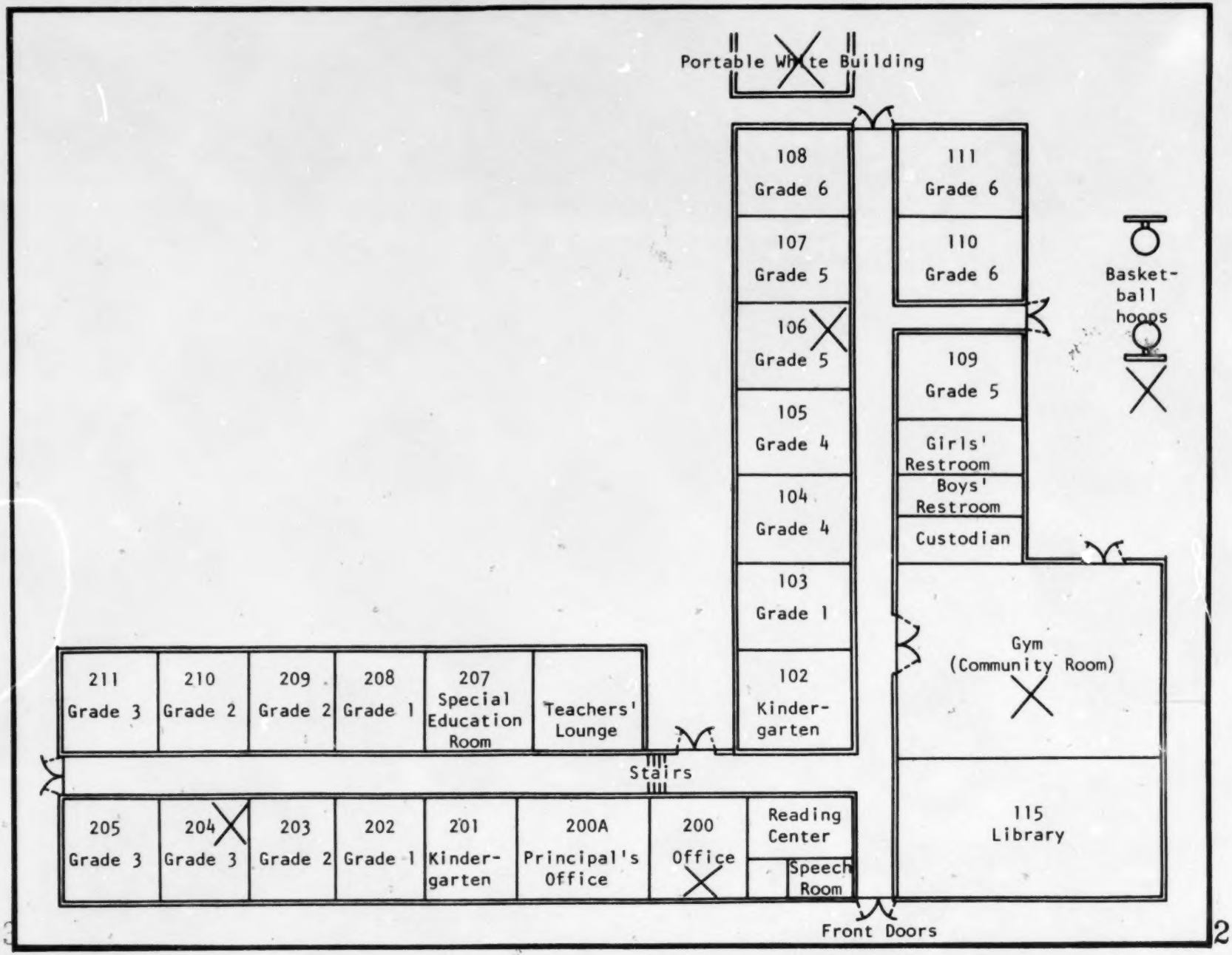
* $p < .10$.

** $p < .05$.

*** $p < .01$.

Figure Caption

Figure 1. Map of the school with the six locations designated.


Portable White Building
108 Grade 6
107 Grade 5
106 Grade 5
105 Grade 4
104 Grade 4
103 Grade 1
102 Kinder-garten
111 Grade 6
110 Grade 6
109 Grade 5
Girls' Restroom
Boys' Restroom
Custodian
Basket-ball hoops
Gym (Community Room)
115 Library
211 Grade 3
210 Grade 2
209 Grade 2
208 Grade 1
207 Special Education Room
Teachers' Lounge
Stairs
205 Grade 3
204 Grade 3
203 Grade 2
202 Grade 1
201 Kinder-garten
200A Principal's Office
200 Office
Reading Center
Speech Room
Front Doors

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